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<b>TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371</b>		ATTORNEY'S DOCKET NUMBER <b>6647/005</b>
INTERNATIONAL APPLICATION NO. <b>PCT/ES2003/000388</b>	INTERNATIONAL FILING DATE <b>July 25, 2003</b>	U.S. APPLICATION NO. (If known, see 37 CFR 1.5) <b>10/522,255</b>
TITLE OF INVENTION <b>MODULE, SYSTEM AND METHOD OF METERING AND MIXING PASTY PRODUCTS</b>		PRIORITY DATE CLAIMED <b>July 26, 2002</b>
APPLICANT(S) FOR DO/EO/US <b>CORTES FERRIZ, Jose</b>		
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**"MODULE, SYSTEM AND METHOD OF METERING AND MIXING PASTY PRODUCTS"**

**Technical area of the invention.-**

The present invention concerns a metering module for pasty products of the type comprising a pasty product tank equipped with means to push the pasty product, a means of opening and closure, adapted to open and close an outlet of said tank.

The present invention also concerns a system for mixing pasty products, consisting of the previous modules and a procedure for using the aforementioned metering module and mixing system.

The present invention finds special, although not exclusive, application in metering and mixing dyes for production of paints.

**State of the art.-**

At present, mixing of primary dyes for production of paint is mostly accomplished manually, supplying precalculated amounts of each dye to a vessel. However, there are a good number of automatic or semiautomatic metering systems, in which the dye is poured from an upper tank into a lower vessel equipped with a load cell, which, once a predetermined weight of dye is present, orders closure of the valve of the upper tank to stop pouring. This operation is repeated for each of the primary dyes, until the mixture is formed with the desired proportion of each.

Although these automatic or semiautomatic systems have correct functionality, they are not completely devoid of problems and drawbacks, among which their known complexity and high cost should be mentioned, and the fact that, on closure of the valve, a final trickle is produced that can reduce the precision of metering, soil the installation and create difficulties in the subsequent operation.

The present invention has the object of providing a metering system for pasty products that simultaneously solves all of these drawbacks and problems.

**Explanation of the invention.-**

For this purpose, a first aspect of the invention is a new metering module for pasty products of the mentioned type, which, in essence, is characterized by the fact that the tank is a hollow prism and the means of pushing consist of a tightly fitted vertical piston in the interior of the tank, coaxial to it, the means of opening and closure consisting of a lower metering valve, whose valve body comprises an internal space with a vertical axis that communicates with the tank, the blocking element of the valve being a sealing head, movable between a position of maximum opening and a closure position, in which the larger base of the sealing element is essentially flush with the valve outlet, closing the tank.

Said sealing element is integral with an actuating rod that moves through the interior of said internal cylindrical space of the valve body and is operated, in turn, by a tappet against the action of a spring.

Preferably, said closure head is shaped like a truncated cone and the tank is cylindrical.

According to another characteristic of the present invention, the module comprises means to purge the air occluded in the interior of the tank beneath the piston.

According to a preferred variant, each module comprises means of injection of air into the interior of the tank, adapted to separate the piston from the bottom of the tank or the mass of pasty product in it.

The metering module of the invention can contain means of opening of a container containing the pasty product situated in the interior of the tank.

Preferably, said means of opening consists of a blade, whose cutting edge is situated on the edge of a cylinder that at least partially encloses the outlet of said tank.

A second aspect of the invention is a mixing system of the pasty products, which comprises at least one module, as already described.

Specifically, the system can contain at least two of the previous modules, arranged consecutively to each other along a first horizontal plane with their corresponding metering valves essentially aligned, and a receiving vessel, movable on a guide device, the vessel being adapted to be stopped beneath each module to receive a dose of pasty product contained in the module to carryout mixing of the pasty products.

Preferably, the mixing system contains means to control movement of the receiving vessel and metering of the pasty products corresponding to each metering module that must be poured into the vessel as a function of the predetermined parameters of the mixture.

In particular, said means of control includes a microprocessor, computer and/or programmable device, provided with software suitable for this purpose, and conventional means of interfacing with the user, and which acts on drive devices and timing devices of the vessel and on the metering valves of each of the metering modules.

According to a third aspect of the invention, a process for metering pasty products is disclosed for use in conjunction with a metering module or the already mentioned mixing system, comprising the stage of placing a pasty product in a container with deformable walls and the additional steps of: introduction to the closed and full container of the pasty product into the interior of the tank; lowering of the piston, compressing the container by deformation of its walls against the inside walls of the tank; and opening of the container by a means of opening that produces an opening in the container, contiguous with the outlet, to cause the pasty product contained in the container to reach the metering valve under the compression effect of the piston.

#### Brief description of the drawings.-

A description of a preferred, but not exclusive, version of the present invention follows, for whose better comprehension it is accompanied by some drawings, given solely as an illustrative, but non-limiting example, in which:

Fig. 1. is a cutaway view of a valve of the metering module of the present invention;

Fig. 2 is a vertical cross section of a preferred variant of a metering module of the present invention;

Fig. 3 is a schematic frontal view of a mixing system for pasty products, consisting of seven modules, like those in Fig. 2;

Fig. 4 is a schematic side view of the metering system of Fig. 3;

Fig. 5 is a view similar to that of Fig. 2 of another variant of a module of the invention, with a container for a pasty product introduced to the tank in the rest position; and

Fig. 6 is a view similar to that of Fig. 5, but in the operating position of the piston.

#### Description of a preferred variant.-

It is apparent in the drawings that the metering module 1 for the pasty products contains a cylindrical tank 2 for pasty products, for example, dyes or paints, and a piston 4, essentially discoidal, to push the pasty product 34 situated in tank 2. Some O-rings 19 guarantee tight fit of

piston 4 in the interior of the tank. The piston 4 is operated vertically along an axis 8 in known fashion by an actuating rod 24, integral with it by hydraulic or pneumatic action. The tank 2 is supported on a lower base 27, combined with an upper support base 28 and guided by actuator 24 through some columns 23.

The tank 2 is open in the lower central part at a discharge 3, traversed by a tube 29, in whose lower end a manual cutoff 25 is found, followed by a metering valve 5, arranged in the interior of a terminal part 30.

The valve 5 has a valve body 6 with an internal space 7, whose axis 8' is shown, in this case, coincident with the vertical axis 8 of tank 2. This internal space 7 is open to passage 29 and, through this, to the interior of tank 2. The valve 5 includes a sealing element 12, formed by a closing head 9, which is preferably shaped like a truncated cone or a trumpet, although it can also be spherical.

The head 9 is continuously movable between a maximum opening position and a closure position (shown in Fig. 1), in which the larger base 11 of the seal 12 is essentially flush with the output 31 of valve 5, closing tank 2.

The sealing element 12 is integral with an actuating rod 13 that runs through the interior of said cylindrical internal space 7 of valve body 6 and is, in turn, operated by a tappet 14 against the action of the spring 10. Thus, the rod 13, and consequently opening and closing of valve 5, can be operated mechanically or manually, in this case, for example, by means of the manual valve 25.

It is apparent in Fig. 2 that the metering module 1 for the pasty products according to the invention is equipped with means for purging of air occluded in the interior of tank 2 beneath piston 4. In the illustrated example, this means of purging includes a hydraulic tube 20, joined to a connector 17 that passes through piston 4 and is equipped with a manual valve 21. Tube 20 is connected upstream of manual valve 21 to a source of relative vacuum with respect to the internal pressure of tank 2.

The module 1 is also equipped with means of injection of air into tank 2, adapted so as to separate the piston 4 from the bottom of the tank or the pasty product mass in the tank. This means of injection is also equipped with an air injector 22, joined to the other connector 18 that passes through piston 4, which permits introduction of air into tank 2 when it is necessary to separate the piston 4, which might be stuck in tank 2.



Fig. 3 and 4 show a mixing system 100 for pasty products, consisting of various, in this case seven, of the aforementioned modules 1.

The modules 1 are arranged adjacent to each other along a first horizontal plane with their corresponding metering valves 5 essentially aligned, attached to a vertical element 32 of a support structure 26.

The support structure 26 contains a horizontal table 33, on which guides 16 are arranged for a receiving vessel 15 of the pasty products 34 contained in modules 1.

The vessel 15 is equipped in the lower part with a load cell 35 (Fig. 4) and has the possibility of being stopped beneath each module 1 and receiving a dose of pasty product contained in module 1 to produce the desired mixture of pasty products.

System 100 contains means to control the movement of the receiving vessel 15 and metering of the pasty product corresponding to each metering module 1, which must introduce it to vessel 15 as a function of the predetermined parameters of the mixture.

This means of control can include a microprocessor, a computer and/or a programmable automatic device and software suitable for this purpose, and conventional means for interfacing with the user, which, since they are extensively known per se, are not shown or described in greater detail. This means of control acts on drives and timing devices of the vessel and on the metering valves 5 of each one of the metering modules 1.

The operating method of the metering and mixing system 100 for pasty products is as follows. With the tanks 2 of modules 1 fully or partially filled with pasty products, the receiving vessel 15 is moved via the guide 16 and successively stopped beneath each one of the modules 1, whose product will be part of the desired mixture. This movement of vessel 15 can be carried out manually or be motorized, in this case with stepping motors, whose movement is programmed.

Each time it is stopped beneath a module 1, the corresponding valve 5 is opened by manual valve 25, with which pouring of the dye from the tank 2 in question begins, until the load cell 35 detects that the programmed amount or an amount sufficiently close to the programmed amount has been introduced, a moment at which valve 5 closes and stops introduction of the pasty product. The cited software can allow for the weight of the column of dye that enters the outlet 31 of valve 5 and vessel 15 to close it at the proper time, so that the sum of the weight of

this column detected by the load cell 35 and the dose of dye that is programmed are within a certain tolerance.

This operation is repeated for each of the modules 1 containing dye to be present in the mixture.

Fig. 5 and 6 show a variant of module 1 of the present invention. This module 1 is particularly designed to be used in the process of the invention.

Specifically, module 1 contains a means of opening of the container 36 with deformable walls, in which the pasty product 34 to be metered is contained, consisting of a blade 37, whose cutting edge 38 is situated above the edge of the cylinder that encloses, at least partially, the output 3 of said tank 2. The blade 37 can assume the shape of a half-rod or half-bevel, for example, and have its upper edge or blade 38 not perpendicular to axis 8.

The container 36, which can be a bag, for example, made of plastic, with or without seams, or even a cardboard container, contains a measured dose of the pasty product to be metered and is introduced to the inside of tank 2 of module 1 (Fig. 1). The container 36 can also be a cardboard or paper container, whose dimensions permit it to fit in the inside prismatic walls of tank 2.

With container 36 in the interior of tank 2, for metering of the pasty product 34 through valve 5, it is merely necessary for piston 4 to descend, compressing container 36, owing to deformation of its walls, against the inside walls of tank 2. As the compression exerted by piston 4 continues, the container 36 is opened by blade 37, which cuts it, producing an opening 39 in the container (Fig. 6) contiguous with the outlet 3, so that the pasty product 34 contained in container 36 reaches metering valve 5, owing to the compression action of piston 4.

Once the contents of container 36 are empty, it is merely necessary to raise piston 4, liberating the rest of the empty container 36, in order to be able to remove it. In this manner, metering of a precise and measured amount of the pasty material is permitted, without soiling the walls of tank 2.

One skilled in the art will understand that the design of the valve, and especially the shape of the sealing element 12, make it possible for metering of dye with this system not to produce leaks from outlet 31. This, in turn, substantially reduces losses of raw material and consequently the environmental problems associated with their management in terms of residues, in comparison with the prior art.

In addition, if the material of container 36 is a recyclable material, the process according to the invention is efficient from an environmental standpoint by minimizing waste production.

It should be understood that the device of the present invention is applicable to any type of pasty product with a rheology similar to that of paints and dyes, these applications also being applicable within the scope of the inventive concept.

## **CLAIMS**

1.- Metering module (1) for pasty products of the type containing a tank (2) of the pasty product, equipped with means of pushing the pasty product and a means of opening and closure, adapted to open and close an outlet (3) of said tank, characterized by the fact that the tank is a hollow prism and the means of pushing consists of a vertical piston (4) that tightly fits in the interior of the tank, coaxial to it, the means of opening and closing consisting of a lower metering valve (5), whose valve body (6) contains an internal space (7) with a vertical axis (8) communicating with the tank, the sealing element (12) of the valve being a closure head (9), movable between a maximum opening position and a closure position, and that the larger base (11) of the sealing device is essentially flush with the outlet (31) of the valve, closing the tank.

2.- Metering module (1) for pasty products according to Claim 1, characterized by the fact that said sealing element (12) is integral with an operating rod (13) that moves through the interior of said cylindrical internal space (7) of the valve body (6) and is, in turn, operated by a tappet (14) against the action of a spring (10).

3.- Metering module (1) for pasty products according to Claim 1, characterized by the fact that said closure head (9) is in the form of a truncated cone.

4.- Metering module (1) for pasty products according to any of the preceding claims, characterized by the fact that the tank (2) is cylindrical.

5.- Metering module (1) for pasty products according to any of the preceding claims, characterized by the fact that it contains means for purging air occluded in the interior of tank (2) beneath piston (4).

6.- Metering module (1) for pasty products according to any of the preceding claims, characterized by the fact that it contains means for injection of air into the interior of tank (2), adapted to separate the piston (4) from the bottom of the tank or from the pasty product in it.

7.- Metering module (1) for pasty products according to Claim 1, characterized by the fact that it contains means of opening (37, 38) of a container (36) of the pasty product situated inside tank (2).

8.- Metering module (1) for pasty products according to Claim 7, characterized by the fact that said means of opening consists of a blade (37), whose cutting edge (38) is situated on the edge of a cylinder that at least partially encloses the output (3) of said tank.

9.- Mixing system (100) for pasty products, characterized by the fact that it contains at least one module (1) according to any of the preceding claims.

10.- Mixing system (100) for pasty products according to Claim 9, characterized by the fact that it contains at least two modules (1) according to the preceding claims arranged adjacent to each other along a first horizontal plane, with their corresponding metering valves (5) essentially aligned, and a receiving vessel (15) movable on a means of guiding (16), the vessel being adapted to be stopped beneath each module and to receive a dose of pasty product contained in the module to produce the mixture of pasty products.

11.- Mixing system (100) for pasty products according to Claim 9 or Claim 10, characterized by the fact that it contains means to control movement of the receiving vessel (15) and metering of the pasty product corresponding to each metering module (1), which must be introduced to the vessel as a function of predetermined mixture parameters.

12.- Mixing system (100) for pasty products according to Claim 11, characterized by the fact that said means of control contains a microprocessor, a computer and/or programmable automatic device, provided with software suitable for this purpose, and conventional means of interfacing with the user, and which operates on drive and timing devices of the vessel and on the metering valves (5) of each of the metering modules (1).

13.- Process for metering of pasty products, to be applied in conjunction with a metering module according to any of the Claims 1 to 8, or with a mixing system according to any of the

Claims 9 to 12, characterized by the fact that it contains the stage of placing a pasty product (34) in a container (36) with deformable walls, and the steps of: introduction of the closed and full container of the pasty products to the interior of the tank (2); lowering of the piston (4), compressing the container (36) for deformation of its walls against the inside walls of the tank; and opening of the container by a means of opening that produce an opening (39) in the container contiguous with the output (3), to cause the pasty product contained in the container to enter the metering valve (5), under the compressive effect of the piston (4).